Development MFER(Medical waveform Format Encoding Rules) Parser

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ABSTRACT

The union of the diagnosis and treatment document and the accompanied inspection data is indispensable for the success of community health cooperation. Especially in the perinatal medicine we require the standardization of diagnosis document and the fetal cardiotocograph data. For diagnosis document, HL7CDA will be the leading solution, but for the fetal cardiotocograph, it does not show enough activity in the standardization. Moreover, the development of the tools and the application utilizes the standard is the key component to expand use of the standard. We have the idea that we describe the CTG data with MFER (Medical wave form Format Encoding Rule). MFER is the specialized in the description of medical waveform and it's generic design enables to apply to any medical wave pattern. There is a degree of freedom in the composition and the interpretation of the data structure in MFER. So we have developed MFER parser to ease the handling with MFER. In this paper, we introduce the implementation of the MFER parser and application to the CTG description with MFER format.

Background

There is no still commonly used standard format for medical waveform data, and is only proprietary formats. This prevents from integrating medical waveforms with the HL7 and CDA because medical waveforms have many variations of formats and it is difficult for a viewer to determine the relevant algorithm to plot these data. So Medical Waveform Format Encoding Rules (MFER) was developed for medical waveforms which the position for medical waveforms is the same as the position of DICOM in radiological modalities. The rule is already received enough reviews and published as the request for international standards. But there is still few implementations for MFER. So We developed MFER parser to help the MFER will be widely used.

Methods

The CTG wave format for a perinatal medical record currently has no standard format, so we decided to develop MFER Parser and converter for MFER format from the proprietary format. MFER only supports major ECG related tags and there is no definition around obstetric and gynecologic region. So we used "TCO" (Tocograph wave) ,"FHR"(Fetal hart record) and add custom tag "FMV"(Fetal

movement data) to describe CTG wave data. And we add the code of the number of fetal and of the classification NST/CST/Delivering. MFER has the notion of multiple channels to store data, we have map FHR, FMV, TCO data to individual channels. We have developed MFER parser with .NET 2.0 framework and C#. The parser has three tier, from lower layer, there are MFER Stream Parser, TLV Parser, Med Wave Parser. MFER Stream Parser handles the encoding and endian variation of MFER data and normalize the stream for upper layer TLV Parser. So TLV Parser is free from the impact of modifications and support additional formats such as Base64 based embedding into HL7 CDA Document, WS-Attachments and so on. MFER data has some tags which holds TLV data (Type, Length, Value) and all tags are optional and there is no restriction for order, endian, and so on. The interpretation must be conducted along with the tag appearance order. The normalization of data stream is already done by MFER Stream parser, so TLV parser only parse TLV triple sets and make related MFER objects with the factory class. Finally MFER document will be parsed as the MFERDoc class which holds the objects that are inherited from CMWTag and hold related tag information.
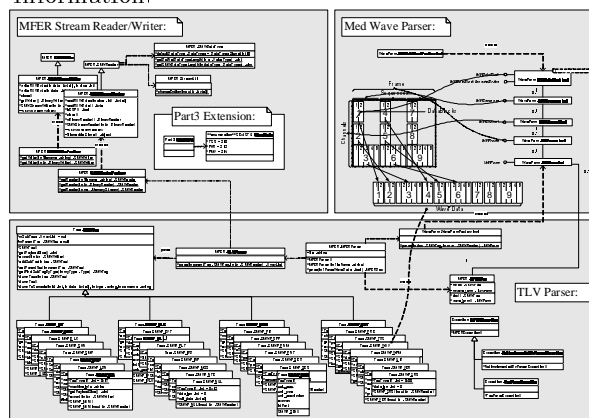

Fig. 1.Overview of MFER Parser

Conclusion

MFER Parser can handle the 8bit AHA compressed Holter monitor record (35min, 1.065MB) at 0.29sec per file. It is enough for the performance as a parser that handles massive transactions of regional healthcare alliance. MF Ranz successfully parsed our MFER document and we confirmed the interoperability. We will support the export for HL7 CDA in future.